

No: 3/89

Ref: EW/C1091

Category: 1c

**Aircraft Type
and Registration:**

Slingsby T67C, G-BLRE

No & Type of Engines:

One Lycoming O-360-D1F (piston engine)

Year of Manufacture:

1985

Date and Time (UTC):

20 November 1988 at 1334 hrs

Location:

Near Aylesbury, Buckinghamshire

Type of Flight:

Training

Persons on Board:

Crew - 2

Passengers - None

Injuries:

Crew - 2 (fatal)

Passengers - N/A

Nature of Damage:

Aircraft destroyed by impact and subsequent fire

Commander's Licence:

Private Pilot's Licence

Commander's Age:

40 years

**Commander's Total
Flying Experience:**

1533 hours (of which up to an estimated 400 were on type)

Information Source:

AAIB Field Investigation

History of the flight

The aircraft was flown from Leavesden by an experienced flying instructor with a new student, who was a recently qualified private pilot. The flight was the first in a series of lessons in aerobatic flight. An unstable north-easterly airstream covered the area giving scattered showers of rain, sleet and snow.

When briefing the student before the flight the instructor asked him if he had any experience of spinning; the student stated that he had done one or two spins during his initial training but had not spun an aircraft for about two years. The instructor then suggested that they should devote the first lesson to practice spin recovery. The aircraft took off at 1314 hrs with sufficient fuel for 2 hours of flight. No ballast was carried, and the aircraft centre of gravity was within the permitted limits.

At 1317 hrs the pilot reported to Luton ATC that the aircraft was at 2,400 feet two miles south-east of Bovingdon and heading for the Cheddington area. At 1324 he advised Luton that he was in the Cheddington area but did not report his height at that time. From radar recordings it was determined that the aircraft flew straight tracks from 1317 hrs to 1326 hrs, when it remained in the same place for about 40 seconds some 3 miles south of Cheddington, indicating that it was engaged in either spin practice or manoeuvres in the vertical plane. It then flew a 360 degree turn over Cheddington before flying west towards the accident site. Between 1329 1/2 and 1334 hrs it was seen to be in manoeuvring

flight near the accident site before again remaining in the same place for 28 seconds in a pattern typical of a spin. The radar return from the aircraft then moved 300 metres to the south-west before it disappeared. No height information was available from the radar recording.

One eye witness saw the aircraft climbing, rolling and diving whilst at a height of several thousand feet. All other eye witnesses saw the aircraft only when it was within one or two thousand feet of the ground, and all described the aircraft as being in a spin with the nose pitched down at an angle of about 45 degrees. Most witnesses saw only two or three turns of the spin but one, who had the aircraft in sight for 20 seconds or more, saw about 10 turns. The sky above and around the aircraft was clear of cloud.

Examination of the wreckage

The aircraft crashed on to a flat grass-covered field just to the south of the A41 road approximately 2 km east of Waddesdon, and burst into flames, which consumed a large proportion of the fibreglass structure. It had been structurally complete before impact and had descended vertically into the ground in a 50° nose-down and wings-level attitude, whilst yawing to the left. The engine had contacted the ground with the aircraft on a heading of 325° M, the airframe coming to rest on a heading of 295° M. The impact pattern was typical of an aircraft that was spinning to the left when it struck the ground. The engine was not turning at the moment of impact although the magneto switch was found in the 'BOTH' position. The extent and severity of the fire indicated that a significant quantity of fuel was on board at the time of the accident. When first examined, the canopy frame was in the closed position ie over the cockpit.

The wreckage was transferred to the AAIB facility at Farnborough for a more detailed examination. This did not reveal any pre-impact defects in the flying control or engine systems, although it was established that the rudder pedals mechanism in the cockpit had been firmly fixed by the effects of the fire in the full right rudder position. The flaps were found in the take-off position but the design of the flaps operating mechanism was such that they could have moved to this position under impact forces.

The aircraft, which was built in 1985, had completed 190 flights and amassed a total flight time of 124 hours at the time of the accident, having undergone a 50 hour maintenance check some 12 days previously.

Spinning trials

The Flight Manual describes the aircraft as having an erect spin which stabilises at a bank angle of 50° with the nose about 40° below the horizon. The rate of rotation is about 150° per second at an IAS of 75 kt in a spin to the right and 80 kt in a spin to the left. If full pro-spin control is not maintained, the aircraft may enter a spiral dive or a high-rotation spin. Recovery action is standard and the aircraft has been shown to recover within one turn of the application of recovery action. If recovery action is taken in reverse order the nose may pitch further down and the rate of rotation may increase. In this event recovery may take up to 3 turns.

The aircraft manufacturer provided details of the spinning trials. Details of 71 trial spins were provided, varying from 2 to 30 turns over the full range of weights and CG positions. Trials were also conducted with unbalanced wing fuel loads. The trials revealed no secondary spin modes and no adverse recovery characteristics.

After the accident the manufacturer carried out a further series of spin trials using the same weight and balance as that of G-BLRE at the time of the accident. Spins were conducted with the engine running and with the engine stopped, with and without the wing flaps lowered. Some recoveries were effected using reverse recovery action and others with the control column held fully back. Attempts were made to induce a spin in the opposite direction by maintaining anti-spin rudder after recovery and also by pulling the control column back as rotation stopped. Recovery was shown to be rapid and effective in all these trials. Attempts to induce the aircraft to reverse its direction of spin were not successful because of the increase in airspeed during recovery.

Previous accidents and incidents

This is the first accident or reported incident to occur to this type of aircraft involving failure to recover from a spin or difficulty in spin recovery. An incident occurred in 1985 when the rudder pedals jammed in a spin but were freed by the pilot. The jam occurred because of a missing bolt. Also in 1985 an incident described the rudders jamming in the neutral position due to a missing cap screw. Mandatory modifications were introduced to increase the frequency of inspection of the rudder pedal assembly and to require the wire locking of the relevant screws. In 1986 an aircraft was found with free play in the joints at the base of the dual control columns. A further mandatory modification was introduced as a result of this incident. A further report in 1986 described how a rudder pedal had jammed against the cockpit sidewall when it had been adjusted to the fully aft position. Pedal clearance was checked on all aircraft and a modification was introduced to be applied when clearance was below the minimum allowed. In 1988 a student's right rudder pedal disengaged from its locked position and moved fully forward during spin recovery: the instructor, whose pedals were not affected, was able to recover from the spin using normal recovery action. A mandatory modification that improved rudder locking was introduced and further instructions were added to the Flight Manual requiring positive engagement of the rudder locking pins to be checked before flight. All the modifications referred to in this paragraph had been incorporated in G-BLRE.

The most recent incident reported before the accident was of failure of a rudder bar layshaft bracket during aerobatics which caused the rudder to jam in the fully left position. The failure is thought to have been due to pre-assembly damage; it is the first report of such a failure and is believed to be an isolated incident.